

Notice of Allowability

Application No.

10/814,779

Examiner

Ngoc-Yen M. Nguyen

Applicant(s)

VOHRA ET AL.

Art Unit

1754

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☐ This communication is responsive to ____.
2. ☒ The allowed claim(s) is/are 1-14.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: ____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date ____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date ____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date ____
4. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413),
Paper No./Mail Date ____
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other ____

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Ms. Adda Gogoris on September 23, 2005.

The application has been amended as follows:

In the specification:

- Page 5, line 10: delete "US" and insert --UK--.
- Page 8, line 4: delete "in step 7 above" and insert --as described below--.
- Page 8, delete line 27 - page 9, line 20 and insert the following paragraph

-- Summary of Invention

Accordingly, the present invention provides an integrated process for the simultaneous recovery of industrial grade potassium chloride and low sodium edible salt with overall KCl yield of 90-95%, which comprises

- (i) desulphatation of bittern with a solution of calcium chloride;

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- (ii) subjecting the desulphated bittern to evaporation until density of 32 to 32.5 °Be' (sp.gr. 1.283-1.288) is achieved;
- (iii) mixing the desulphated bittern obtained in step (ii) with a concentrated solution of $MgCl_2$ to obtain high purity carnallite and a residual bittern;
- (iv) decomposing the carnallite with water to obtain ca. 60 % of overall KCl and a first carnallite decomposed liquor;
- (v) crystallizing from the residual bittern residual NaCl and KCl in the form of crude carnallite and thereby obtaining a $MgCl_2$ -rich end bittern;
- (vi) decomposing the crude carnallite obtained in step (v) with water to produce KCl-enriched low sodium salt in 30-35% overall yield with respect to KCl in the original 32 to 32.5 °Be' (sp.gr. 1.283-1.288) bittern, as well as a second carnallite decomposed liquor;
- (vii) collecting the first and second carnallite decomposed liquors obtained in steps (iv) and (vi) above and treating the resulting mixture with upgraded lime to generate low boron magnesium hydroxide and filtrate containing $CaCl_2$ and KCl;
- (viii) recycling the filtrate obtained in step (vii) above to step (i) above for desulphatation of bittern while simultaneously recovering KCl lost in carnallite decomposed liquors;
- (ix) recycling the $MgCl_2$ -rich end bittern of step (v) for sustained production of high purity carnallite in step (iii) and also for production of $CaCl_2$, and

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(x) recycling the end bittern to reclaim excess MgCl_2 and bromine and produce MgCl_2 and its derivatives. --

- page 9, line 24: after " CaCl_2 to SO_4^{2-} ", insert --in the bittern--.

- page 9, delete lines 25-28 and insert the following paragraph:

-- In another embodiment of the invention, in step (iii), one part of 32 to 32.5 °Be' of the desulphated bittern obtained in step (ii) (sp.gr. 1.283-1.289) is mixed with 2.0-2.5 parts of the end bittern containing 400-440 g/L MgCl_2 and the density of the resultant bittern is in the range of 34.0-35.0 °Be' (sp.gr. 1.306-1.318) and more preferably in the range of 34.4-34.6 °Be' (sp.gr. 1.311-1.315). --

- page 9, lines 29, after "of the invention", delete "in" and insert -- before--.

- page 9, line 32: after "in step", delete (iv) and insert --(iii)--.

- page 10, line 3: before "bittern is concentrated", insert --residual--.

- page 10, line 10: after "the low sodium salt contains 40-50% KCl and 50-60%", insert --NaCl--.

- page 10, lines 11-12: after "invention, the", insert --combined--; delete "liquor contains" and insert --liquors contain--.

- page 13, lines 16 and 22: delete "mother liquor" and insert --residual bittern--.

In the claims:

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1. (currently amended): An integrated process for the simultaneous recovery of industrial grade potassium chloride and low sodium edible salt with overall KCl yield of 90-95%, which comprises

- (i) desulphatation of bittern with a solution of calcium chloride;
- (ii) subjecting the desulphated bittern to evaporation untill density of 32 to 32.5 °Be' (sp.gr. 1.283-1.288) is achieved;
- (iii) mixing the desulphated bittern obtained in step (ii) with a concentrated solution of $MgCl_2$ to obtain high purity carnallite and a residual bittern;
- (iv) decomposing the carnallite with water to obtain ca. 60 % of overall KCl and residual bittern a first carnallite decomposed liquor;
- (v) ~~concentrating residual bittern to obtain~~ crystallizing from the residual bittern residual NaCl and KCl in bittern in the form of crude carnallite and ~~carnallite decomposed liquor~~ thereby obtaining a $MgCl_2$ -rich end bittern;
- (vi) decomposing the crude carnallite obtained in step (v) with water to produce KCl-enriched low sodium salt in 30-35% overall yield with respect to KCl in the original 32 to 32.5 °Be' (sp.gr. 1.283-1.288) bittern, as well as a second carnallite decomposed liquor;
- (vii) collecting the first and second carnallite decomposed liquors obtained in steps (iv) and (vii vi) above and treating the resulting mixture with upgraded lime to generate low boron magnesium hydroxide and filtrate containing $CaCl_2$ and KCl;

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(viii) recycling the filtrate obtained in step (vii) above to step (i) above for desulphatation of bittern while simultaneously recovering KCl lost in carnallite decomposed liquors;

(ix) recycling the MgCl_2 -rich end bittern of step (iii v) for sustained production of high purity carnallite in step (iii) and also for production of CaCl_2 and

~~(x) utilizing any excess MgCl_2 to recover bromine and obtain $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$ and its derivatives.~~

2. (currently amended): A process as claimed in claim 1 wherein in step (i) the density of bittern taken is in the range of 28-30 °Be' (sp.gr. 1.24-1.26).

3. (currently amended): A process as claimed in claim 1 wherein in step (i) the stoichiometric ratio of CaCl_2 to SO_4^{2-} in the bittern is in the ratio of 0.9:1 to 1.1:1, and preferably 1:1.

4. (currently amended): A process as claimed in claim 1 wherein in step (iv iii), one part of 32 to 32.5 °Be' of the desulphated bittern obtained in step (ii) (sp.gr. 1.283-1.289) is mixed with 2.0-2.5 parts of the end bittern containing 400-440 g/L MgCl_2 and the density of the resultant bittern is in the range of 34.0-35.0 °Be' (sp.gr. 1.306-1.318) and more preferably in the range of 34.4-34.6 °Be'[[.]] (sp.gr. 1.311-1.315).

5. (currently amended): A process as claimed in claim 1 wherein ~~in~~ before step (iii) the 32-32.5 °Be' (sp.gr. 1.283-1.289) bittern is filtered if required to remove insoluble matter such as dust, black particles and organic matter.

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6. (currently amended): A process as claimed in ~~Claim~~ claim 1 wherein in step (~~iv~~ iii), the NaCl content of carnallite is in the range of 0.2-2.0%, preferably in the range of 0.2-0.4%.

7. (currently amended): A process as claimed in claim 1 wherein in step (iv) the purity of KCl obtained is in the range of 97-99% after washing with water to remove adhering MgCl_2 .

8. (currently amended): A process as claimed in claim 1 wherein in step (v), the residual bittern is concentrated to a final density of 36.5-37.2 °Be' (sp.gr. 1.306-1.318) either by solar evaporation or preferably through forced evaporation in an open pan or still more preferably in a multiple effect evaporator for recovery of water.

9. (currently amended): A process as claimed in claim 1 wherein in step (v) the crude carnallite contains 14-16% KCl and 18-22% NaCl.

10. (currently amended): A process as claimed in claim 1 wherein in step (vi) the low sodium salt contains 40-50% KCl and 50-60% NaCl.

11. (currently amended): A process as claimed in claim 1 wherein in step (vii), the combined carnallite decomposed liquors contains 15-20 mg/L B_2O_3 and 60-80 g/L Mg.

12. (currently amended): A process as claimed in claim 1 wherein in step (vii), the $\text{Mg}(\text{OH})_2$ obtained is converted into MgO containing <0.02% B_2O_3 .

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13. (currently amended): A process as claimed in claim 1 wherein in step (vii), the filtrate contains 15-30% CaCl_2 and 5-10% KCl.

14 (New). A process as claimed in claim 1 wherein the end bittern is recycled to reclaim excess MgCl_2 and bromine and produce $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$ and its derivatives.

Support for the changes can be found on page 13, line 5 to line 33 and Examples 2-5.

REASONS FOR ALLOWANCE

The following is an examiner's statement of reasons for allowance: the prior art does not teach or suggest a process for producing both an industrial grade potassium chloride and a low sodium edible salt from a bittern, which comprises the step as required in the instant claim 1.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ngoc-Yen M. Nguyen whose telephone number is (571) 272-1356. The examiner is currently on Part time schedule.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Stan Silverman can be reached on (571) 272-1358. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed (571) 272-1700.



Ngoc-Yen M. Nguyen
Primary Examiner
Art Unit 1754

nmn
September 30, 2005